

THE MINERAL INDUSTRY OF COLORADO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Bureau of Mines, U.S. Department of the Interior, and the Colorado Geological Survey for collecting information on all nonfuel minerals.

In 1996, for the second consecutive year, Colorado ranked 23d among the 50 States in total nonfuel mineral production value,¹ according to the U.S. Geological Survey (USGS). The estimated value for 1996 was \$528 million, a 7.4% decrease from that of 1995. This followed a 39% increase from 1994 to 1995 (based on final 1995 data). The State accounted for nearly 1.5% of the U.S. total nonfuel mineral production value.

More than 70% of Colorado's nonfuel mineral production value came from industrial minerals, especially construction sand and gravel, portland cement, and crushed stone, in descending order of value. Most of the State's remaining nonfuel mineral value resulted from the production of molybdenum, gold, and zinc. In 1996, large increases in the values of construction sand and gravel and portland cement and a relatively moderate increase in crushed stone were more than compensated for by a significant decrease in the value of molybdenum. A 46% decrease in molybdenum was the largest single decrease in nonfuel mineral value in 1996, resulting in the State's overall drop in value. Average to relatively low prices for molybdc oxide throughout the year caused this decrease in part. In 1996, other nonfuel minerals that increased in value included those of gold, lead, silver, Grade-A helium, and fire and bentonite clays. Other values that decreased in 1996 included those of zinc, industrial sand and gravel, crude gypsum, dimension stone, masonry cement, common clays, and lime.

Conversely, molybdenum accounted for the single largest increase in value from 1994 to 1995, rising by 144%. High prices paid for molybdc oxide early in the year contributed to this significant increase in 1995. In 1995, most commodities, especially those of construction sand and gravel, portland cement, and crushed stone, contributed to the year's increase in value. Only the values of common clays, lime, and gemstones showed small decreases that year.

Compared with USGS estimates of quantities produced in the other 49 States during 1996, Colorado remained fifth in lead and sixth in zinc; rose from eighth to seventh in construction sand and gravel; and dropped from first to third in molybdenum and from seventh to eighth in gold. In addition, substantial quantities of portland cement were produced in the State.

The following narrative information was provided by the Colorado Geological Survey² (CGS). The precious metals industry in Colorado set a modern era (post-World

War II) production record in 1996 with approximately 7,650 kilograms of gold and 9,700 kilograms of silver. Production of metals will decline in 1997 because of the closure of the San Luis Mine and the Black Cloud Mine.

The Cresson Mine, which had total proven and probable reserves of 82 million metric tons³ at a grade of 0.9 gram of gold per metric ton, began production in February 1995. The open pit mine produced approximately 5,400 kilograms gold and an estimated 780 kilograms of silver in 1996 and projected production of about 5,600 kilograms gold and 840 kilograms of silver in 1997 and succeeding years. About 275 people were employed at Cresson in 1996, and the same number was projected for 1997. Operating costs at the mine were about \$200 per ounce of gold. Pikes Peak Mining Co., operator of the Cresson Mine, continued an aggressive precious metals exploration and development program in the Cripple Creek District, Teller County, and reported being successful, although no details were given.

The San Luis Gold Mine, Costilla County, reported having a productive year in 1996 producing approximately 2,100 kilograms of gold. Unfortunately, the mine was scheduled to close in the first quarter of 1997 because of ore exhaustion. About 100 jobs will be lost in an area of chronic underemployment, the San Luis Valley.

Base metal production, excluding molybdenum, was minor in Colorado. ASARCO Incorporated produced 800 tons per day of copper-lead-zinc-silver-gold ore from its Black Cloud Mine at Leadville, Lake County, through September. The company announced on October 23 that the mine would soon cease production and enter a maintenance status. Approximately 200 employees currently work at the mine and mill. Most of these jobs will be lost.

At the beginning of 1995, the free market price for molybdc oxide was \$15.50 per pound. By yearend the price had fallen to about \$4.50 per pound. During 1996, the price varied between \$3 and \$5 per pound. The Henderson Mine produced approximately 15,000 tons of molybdenum during 1996, down from 19,000 tons in 1995. Given stable economic conditions, the production forecast for 1997 is 15,000 tons. The Henderson Mine and mill employed 460 to 470 people.

The sand, gravel, and crushed stone industries had a productive 1996 in the Front Range metropolitan area

from Colorado Springs to Fort Collins and in selected areas of western Colorado. The CGS expected production of aggregates in 1996 to be about 39 million tons, down slightly from 1995 levels. Decreased residential and commercial construction was expected to lead to a leveling off of sand, gravel, and crushed stone production in 1997 to about 36 million tons.

Colorado Diamond Co., a subsidiary of Redaurum Red Lakes Mines Ltd. of Toronto, announced a 270,000-ton-per-year trial mining program on their Kelsey Lake kimberlite prospect in the State line district of Larimer County. The Kelsey Lake Mine is North America's first commercial diamond producer since the turn of the century. Open pit mining at Kelsey Lake began in late 1995; however, the 160-metric-ton-per-hour diamond processing plant commenced operations in May 1996. The mine and processing plant will be upgraded to 900,000-ton-per-year production after the 2-year trial mining program. The company reported initial diamond-bearing kimberlite reserves of 16.9 million tons down to 100 meters depth.

During the summer of 1996, a 28.3-carat clear yellow gem-quality diamond was recovered from the Kelsey Lake kimberlite. Previous to this, a 14.2-carat gem-quality

white diamond was unearthed during bulk sample testing in 1994. Redaurum expected the mine to produce about 25,000 carats of diamonds in 1996 and 100,000 carats in 1997. As of the end of the year, about 65% of the recovered diamonds were of gem quality.

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

The USGS 1996 mineral production data published in this chapter were estimated as of December 1996. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: <http://minerals.er.usgs.gov/minerals/contacts/comdir.html>

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³All tons are metric tons unless otherwise specified.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN COLORADO 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays		2,320	294	2,050 3/	324 3/	1,980 3/
Gemstones		267	NA	245	NA	247
Gold 4/ kilograms	4,420	54,700	W	W	W	W
Sand and gravel (construction)	29,000	109,000	34,100	141,000	38,200	164,000
Stone:						
Crushed	8,260 5/	52,300 5/	9,000	58,500	9,800	64,700
Dimension metric tons	3,630 5/	51 5/	17,800	2,640	12,100	2,250
Combined value of cement, clays [fire clay (1996), kaolin (1995-96)], gypsum (crude), helium (Grade-A), lead, lime, molybdenum, peat, sand and gravel (industrial), silver, stone [crushed traprock and volcanic cinder (1994), dimension marble (1994)], zinc, and values indicated by symbol W	XX	192,000	XX	366,000	XX	295,000
Total	XX	410,000	XX	570,000	XX	528,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; value included with "Combined value" data.

4/ Recoverable content of ores, etc.

5/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
 COLORADO: 1/ CRUSHED STONE 2/ SOLD OR USED BY PRODUCERS
 IN 1995, BY USE 3/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	185	\$1,040	\$5.62
Filter stone	8	22	2.75
Other coarse aggregate	25	116	4.64
Coarse aggregate, graded:			
Concrete aggregate, coarse	566	3,890	6.87
Bituminous aggregate, coarse	800	4,510	5.64
Bituminous surface treatment aggregate	5	54	10.80
Railroad ballast	18	92	5.11
Fine aggregate (-3/8 inch): Stone sand, bituminous mix or seal 4/	608	3,110	5.12
Coarse and fine aggregates:			
Graded road base or subbase	556	2,560	4.60
Unpaved road surfacing	10	94	9.40
Terrazzo and exposed aggregate	48	540	11.30
Crusher run or fill or waste	418	1,120	2.68
Other construction materials 5/	52	290	5.58
Agricultural: Poultry grit and mineral food	(6/)	(6/)	16.50
Chemical and metallurgical: Cement manufacture 7/	1,190	6,470	5.44
Special:			
Asphalt fillers or extenders	(6/)	(6/)	19.80
Other specified uses not listed	(6/)	(6/)	3.70
Unspecified: 8/			
Actual	3,540	26,900	7.60
Estimated	751	4,680	6.23
Total	9,000	58,500	6.50

1/ To avoid disclosing company proprietary data; "District tables were not produced for 1995."

2/ Includes granite, limestone, miscellaneous stone, quartzite, sandstone, traprock, and volcanic cinder and scoria.

3/ Data are rounded to three significant digits; may not add to totals shown.

4/ Includes screening (undesignated).

5/ Includes drain fields.

6/ Withheld to avoid disclosing company proprietary data; included in "Total."

7/ Includes flux stone.

8/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
 COLORADO: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994				1995			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	8	2,550	\$13,900	\$5.46	8	2,600	\$15,300	\$5.88
Granite	16 r/	5,110 r/	33,800 r/	6.62 r/	9	5,040	33,500	6.65
Sandstone	8 r/	603 r/	4,610 r/	7.65 r/	7	696	7,150	10.30
Traprock	(2/)	(2/)	(2/)	(2/)	1	W	W	3.54
Quartzite	--	--	--	--	1	W	W	5.80
Volcanic cinder and scoria	(2/)	(2/)	(2/)	(2/)	1	W	W	7.30
Miscellaneous stone	(3/)	(3/)	(3/)	(3/)	2	W	W	6.68
Total	XX	8,260 r/	52,300 r/	6.33 r/	XX	9,000	58,500	6.50

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Excludes traprock and volcanic cinder and scoria from State total to avoid disclosing company proprietary data.

3/ Revised to zero.

TABLE 4
 COLORADO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995,
 BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	4,810	\$23,600	\$4.91
Plaster and gunite sands	71	506	7.13
Concrete products (blocks, bricks, pipe, decorative, etc.)	292	2,910	9.97
Asphaltic concrete aggregates and other bituminous mixtures	2,290	11,100	4.83
Road base and coverings 2/	5,860	21,300	3.63
Fill	1,460	3,820	2.62
Snow and ice control	151	820	5.43
Other 3/	2,490	8,920	3.58
Unspecified: 4/			
Actual	10,800	39,900	3.69
Estimated	5,870	27,700	4.71
Total or average	34,100	141,000	4.12

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Includes railroad ballast.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
 COLORADO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995,
 BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	649	4,380	690	2,490
Asphaltic concrete aggregates and road base materials 3/	3,460	14,700	1,900	6,430
Other miscellaneous uses 4/	9	50	2,300	8,080
Unspecified: 5/				
Actual	2,330	8,900	3,690	12,800
Estimated	668	3,700	667	2,610
Total	7,110	31,700	9,250	32,400
	District 3		District 4	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	63	201	2,630	14,600
Asphaltic concrete aggregates and road base materials 3/	497	1,380	1,900	6,840
Other miscellaneous uses 4/	--	--	16	53
Unspecified: 5/				
Actual	192	733	3,430	13,000
Estimated	168	355	2,470	12,800
Total	919	2,670	10,400	47,300
	District 5		District 6	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	953	4,430	188	922
Asphaltic concrete aggregates and road base materials 3/	879	2,860	1,130	4,810
Other miscellaneous uses 4/	126	570	44 6/	168 6/
Unspecified: 5/				
Actual	1,180	4,570	--	--
Estimated	999	4,130	905	4,070
Total	4,140	16,600	2,260 6/	9,970 6/

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Include fill, road and other stabilization (cement), and snow and ice control.

4/ Includes railroad ballast.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

6/ Includes unspecified within all districts.